

**CHARACTERIZATION OF HYDROGEN FLOW
THROUGH POROUS METAL FLOW RESTRICTORS FOR
THE DESIGN AND SELECTION OF JOULE-THOMSON
EXPANDERS**

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Utilization of porous metal flow restrictors as the Joule-Thomson (J-T) expander greatly enhances contamination tolerance in comparison to orifice or capillary tube J-T's. Therefore, flow tests were conducted using commercially available porous plugs. The flow tests conducted used hydrogen over a very wide range of pressures, flow rates and temperature. These tests were used to determine mass flow as a function of temperature (including the effects of real gas properties and liquifaction) and pressure difference/ratio (e.g. sonic exit effects). The flow test design and results are presented in detail. Based on these results, a combination of porous plugs were selected for use in a continuous operation vibration-free, long-life 25 K sorption cryocooler, which has been built and is now in final performance testing. This cooler will be flown on the University of California at Santa Barbara (UCSB) Long Duration Balloon (LDB) cosmic microwave background radiation experiment. The flow test results and the conclusions drawn from them should prove applicable to other refrigerants and temperature ranges.

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